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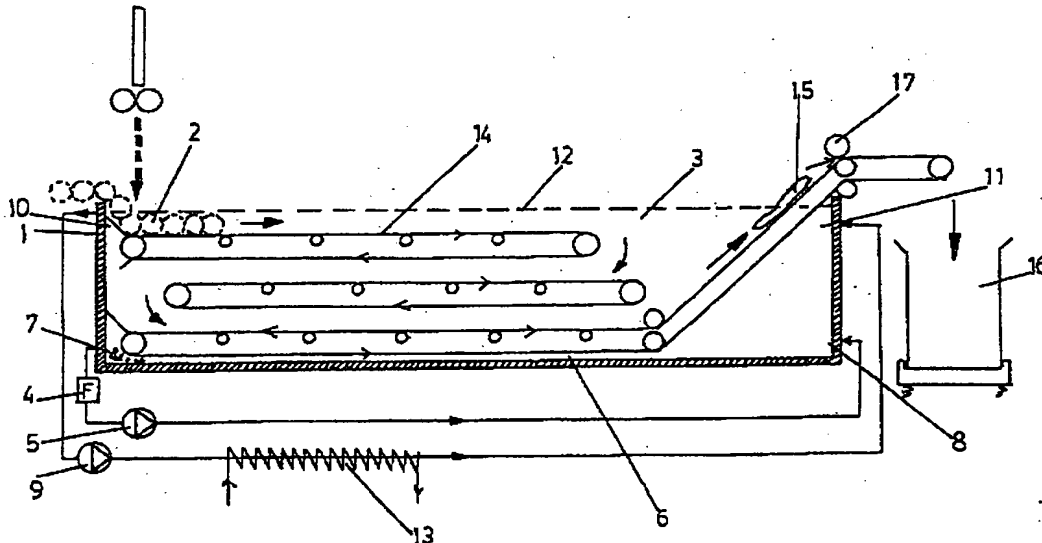
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/NL98/00028</p> <p>(22) International Filing Date: 16 January 1998 (16.01.98)</p> <p>(30) Priority Data: 1005029 17 January 1997 (17.01.97) NL</p> <p>(71) Applicant (for all designated States except US): MODIGLASS MODIFIED ASPHALT- AND GLASSMATMACHINES LTD. [CH/CH]; Bahnhofstrasse 27, CH-6304 Zug (CH).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): MUELBECK, Martin [AT/AT]; A-5222 Pfaffstaedt 10 (AT).</p> <p>(74) Agent: KOOMEN, M., J., I.; Kennemerstraatweg 35-37, NL-1814 GB Alkmaar (NL).</p>	<p>(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. In English translation (filed in Dutch).</p>	

(54) Title: METHOD AND APPARATUS FOR RECYCLING OF BITUMINOUS MATERIALS, MORE IN PARTICULAR BITUMINOUS ROOFING MATERIALS



## (57) Abstract

Method for recycling bituminous materials, more in particular for recycling bituminous roofing materials, made up of bitumen and other components from roofing material, such as insulation materials made up of polystyrene, polyurethane, mineral wool and such like and components such as slate chippings, polyester fleece and glass fleece or -fabric, while the bituminous materials are heated, in such a way that the bitumen component in the bituminous materials melts, while the bitumen and the other components from the roofing material are separated.

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Method and apparatus for recycling bituminous materials, more in particular bituminous roofing materials.

5 The invention relates to a method and apparatus for recycling bituminous materials, more in particular bituminous roofing materials.

10 During the production of bituminous roofing rolls a waste percentage arises between 1% and 2%. A part of these waste rolls is sold as second or B choice, while the remainder will go to a waste treatment and eventually will be burned. Dumping of the waste is costly.

15 When roofs are pulled down bituminous roofing material is obtained to which often insulation material is still attached. This material also goes to a waste treatment. This material, which is not separated, that is to say, in which the insulation and the roofing form one whole, provides a large problem because the combination may be made up of bituminous rolls with a polystyrene insulation, a polyurethane insulation or a mineral wool insulation and such like. It is clear that this poses a big environmental problem.

25 The present invention aims to provide a method for recycling bituminous materials, more in particular for recycling bituminous roofing materials, which are made up of bitumen and other components from roofing material such as inlaids or insulation materials made of polyurethane, mineral wool and such like and components such as slate chippings, polyester fleece or glass fleece or -fabric and such like.

30 The method according to the invention to that end is characterized in that the bituminous materials are heated, in such a way that the bitumen component in the bituminous materials melts, while the bitumen and the other components from the roofing material are separated.

35

According to a characteristic of the method according to the invention the bituminous material is heated by leading high temperature bitumen at great speed along the bituminous material that is to be melted.

5 According to another characteristic of the method according to the invention the bitumen by means of which the bituminous material is melted consists of oxidized or non-oxidized bitumen of ca 200 °C.

10 According to a further characteristic the bitumen is separated from the remainder of the components of the bituminous material by means of baskets or strainers.

The invention further relates to an apparatus for applying a method for recycling bituminous materials, more in particular for recycling bituminous roofing materials, formed by bitumen and other components from roofing material, such as insulation materials made up of polystyrene, polyurethane, mineral wool and such like and components such as slate chippings, polyester fleece and glass fleece or -fabric, formed by a vessel for receiving the bituminous materials, with means for the feeding into the vessel of bitumen, with means for containing the bituminous materials, with means for bringing the content into a flow, with means for heating the content, and with means for filtering or sieving the content, and with means for discharging the sieved or filtered non-bituminous components.

According to a further characteristic of the invention means are present for conveying the bituminous materials within the vessel.

30 There are several ways in which the rolls can be melted.

Within the vessel according to a characteristic of the invention baskets are present in which one or two rolls can be put. After this the vessel is filled up with bitumen up to a level above the rolls and the pumps are operated. After a while the rolls will be melted and the slate chippings, if present, remain in the filter and the inlaid of the polyester fleece or glass fleece will remain behind in the baskets or strainers. The recovered bitumen and any polymers are pumped back into the system via the filter for the production of for instance bituminous roofing rolls.

Further characteristics and particulars are given in the description following hereafter with reference to a drawing of an example of an embodiment.

The drawing shows a vessel according to the invention for recycling bituminous roofing, whereby use is made of a conveyor belt mounted within the vessel for receiving the bituminous materials.

As can be seen in the drawing, bituminous bands 2 including the slate chippings, the inlaid and any insulation material attached thereto are put into a vessel 1. The vessel is filled up to a level above the material with non-blown bitumen 3 of ca 200 °C. The vessel is provided with one or more filters 4 with openings having a size of 1 to 10 mm.

Further a pump 5 is provided which is connected to the bottom 6 and which carries all impurities such as slate chippings through the filter 4 and whereby purified bitumen 8 is carried back. A second pump device 9 is provided which suctions the bitumen at the upper surface 10 out of the vessel 1 and carries this back to the other side 11 of the vessel, also at the upper surface. The polymers which come to float at the upper surface during the melting of the rolls are suctioned

out and mixed with bitumen.

The system that develops in this manner has a strong horizontal flow at the bottom 6, which takes care of the discharge of impurities 7, as well as at the  
5 surface 12 which takes care of the molten and floating polymers being carried out of the vessel and being again mixed via the pump and the return system.

A difference can be made between rolls without insulation being attached thereto and rolls to which  
10 insulation is attached. For both systems a high velocity of liquid flow of the bitumen is important because the heat transfer for the melting process is dependant on the square of the velocity of the flow. By means of a double walled construction of the vessel or  
15 the piping system extra energy can and/or must be supplied by means of a hot oil circulation system 13.

In the vessel a steel conveyor belt 14 is further provided onto which the melting rolls 2 are being moved slowly and are conveyed to the back side of the vessel  
20 and where this belt under an angle of ca 30 ° runs sloping upward out of the vessel and onto which the rest 15 of the inlaid and further waste materials can be dumped into a waste container 16. The apparatus can further be provided with a press device 17 by means of  
25 which the rest 15 of the inlaid and other materials can be removed from the bitumen being attached thereto as much as possible before it is dumped into the waste container.

The proportions of the vessel can be a width of 2 meter and a length of 10 meter. Such a system is suitable for  
30 processing ca 2000 m<sup>2</sup> per 24 hours. In another embodiment whereby the material that is to be recycled is formed by roofcovering materials which have come up

from a demolition and whereby the insulation is attached to the bituminous roofing the vessel will have much larger proportions, having a width of ca 4 meter to a length of ca 40 meter. In that case use will be made of a metal belt moving slowly forward through the vessel. The bitumen will be melted by the high temperature and high velocity circulating bitumen flows. The impurities such as inlaid, slate chippings, parts of insulation plates and such like will be slowly discharged from out of the melting vessel by the conveyor belt and discharged into the container.

The invented recycling system unburdens the environment in the sense that the recovered bitumen can be used again and again. The bitumen which is pulled down from the roof has only slightly aged and can easily be brought into to an excellent quality again by the adding and mixing of polymers.



## C l a i m s

1. Method for recycling bituminous materials, more in particular for recycling bituminous roofing materials, made up of bitumen and other components from roofing material, such as insulation materials made up of polystyrene, polyurethane, mineral wool and such like and components such as slate chippings, polyester fleece and glass fleece or -fabric, characterized in that the bituminous materials are heated, in such a way that the bitumen component in the bituminous materials melts, while the bitumen and the other components from the roofing material are separated.
2. Method according to claim 1, characterized in that the bituminous material is heated by leading high temperature bitumen at great speed along the bituminous material that is to be melted.
3. Method according to claim 2, characterized in that the bitumen by means of which the bituminous material is melted consists of oxidized or non-oxidized bitumen of ca 200 °C.
4. Method according to one of the preceding claims, characterized in that the bitumen is separated from the remainder of the components of the bituminous material by means of filters.
5. Method according to one of the preceding claims, characterized in that the bitumen is separated from the remainder of the components of the bituminous material by means of baskets or strainers.
6. Method according to one of the preceding claims, characterized in that the bitumen is separated from the remainder of the components of the bituminous material

by means of a perforated or non-perforated conveyor belt.

5 7. Apparatus for applying a method for recycling bituminous materials, more in particular for recycling bituminous roofing materials, formed by bitumen and other components from roofing material, such as insulation materials made up of polystyrene, polyurethane, mineral wool and such like and components such as slate chippings, polyester fleece and glass fleece or  
10 -fabric, formed by a vessel for receiving the bituminous materials, with means for the feeding into the vessel of bitumen, with means for containing the bituminous materials, with means for bringing the content into a flow, with means for heating the content,  
15 and with means for filtering or sieving the content, and with means for discharging the sieved or filtered non-bituminous components.

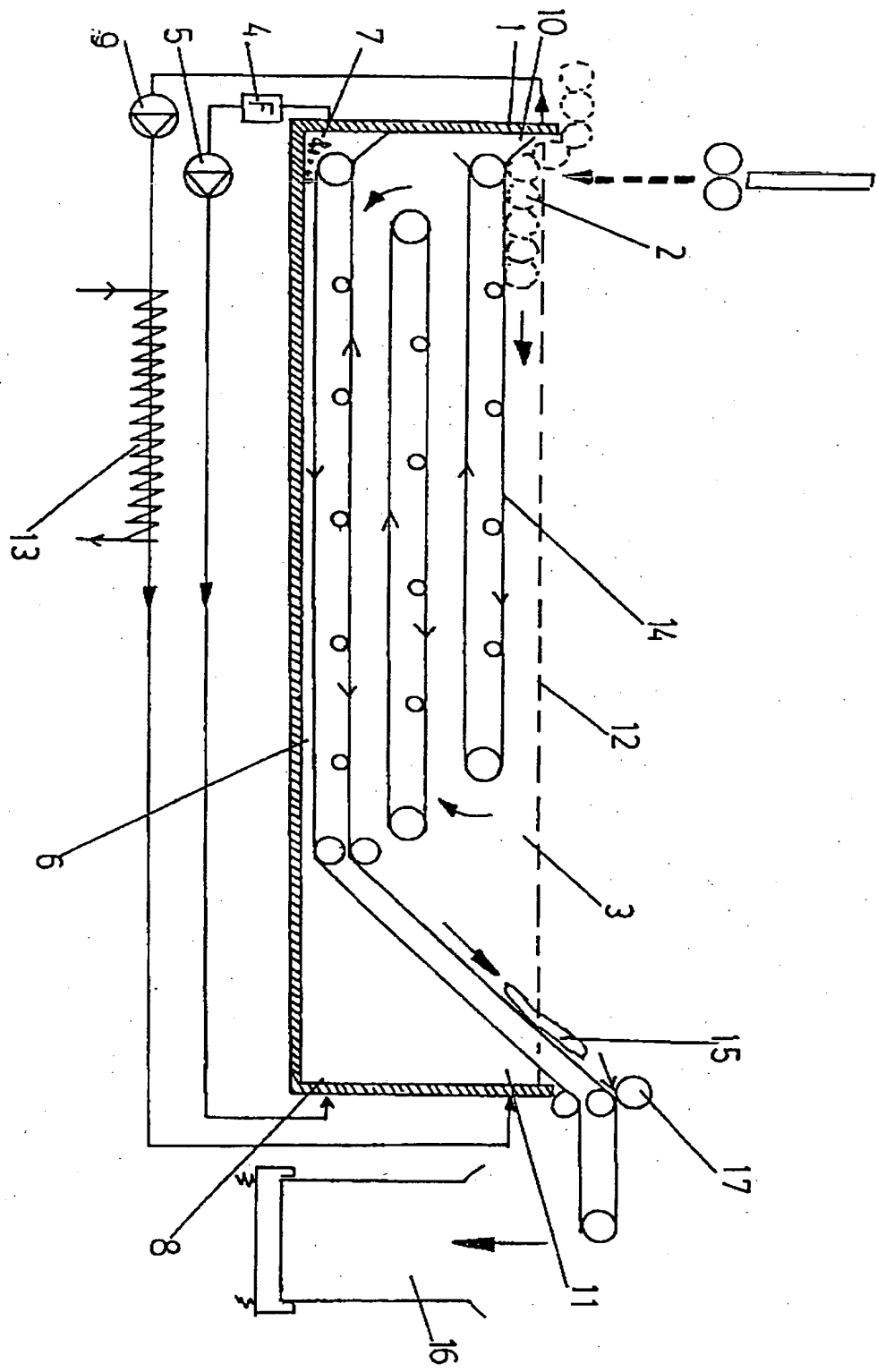
20 8. Apparatus according to claim 7, characterized in that means are present for conveying the bituminous materials within the vessel.

9. Apparatus according to claim 7, characterized in that the means for filtering the content are formed by one or more filters.

25 10. Apparatus according to claim 9, characterized in that the filters are provided with openings having a size of between 0,5 mm up to 10 mm.

30 11. Apparatus according to one of the preceding claims, characterized in that the apparatus is provided with a perforated or non-perforated conveyor belt for conveying the bituminous material forward within the vessel and for discharging it from out of the vessel.

12. Apparatus according to one of the preceding claims, characterized in that the apparatus is provided with strainers or baskets for containing the bituminous material.
- 5 13. Apparatus according to one of the preceding claims, characterized in that the means for circulating the content are formed by one or more pumps.
14. Apparatus according to one of the preceding claims, characterized in that the means for heating the content  
10 are formed by a heat exchanger.
15. Apparatus according to one of the preceding claims, characterized in that the apparatus is provided with means by means of which the rest of of the non-bituminous waste materials after the melting process may  
15 stripped of bitumen which is attached to it.
16. Apparatus according to claims 15, characterized in that the means are formed by a press device.



# INTERNATIONAL SEARCH REPORT

Inte:      mal Application No  
PCT/NL 98/00028

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6   B29B17/02   C10C3/00   //B29K95:00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6   B29B   C10C   C08L   B03B   B09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 4 330 340 A (WAYNE H. CARLTON) 18 May 1982 see the whole document	1-3,6, 11,13,15 8
X	PATENT ABSTRACTS OF JAPAN vol. 14, no. 386 (C-0750), 21 August 1990 & JP 02 144187 A (KYUSHU NOZAWA K.K.), 1 June 1990, see abstract	1,2,4,7, 9,10,14
X	DE 41 28 014 A (RÜTGERSWERKE AG) 25 February 1993 see the whole document see example 1	1-4,7,9, 10
P,X	DE 196 12 971 C (BETTINA LINDNER) 26 June 1997 see the whole document	1,4
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Date of the actual completion of the international search

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A	<p>DATABASE WPI Section Ch, Week 8412 Derwent Publications Ltd., London, GB; Class LQ, AN 84-072083 (12) XP002039397 &amp; JP 59 027 007 A (CHIYODA RES. &amp; DEV. K.K.), 13 February 1984 see abstract</p>	1,4, 7-10,14
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